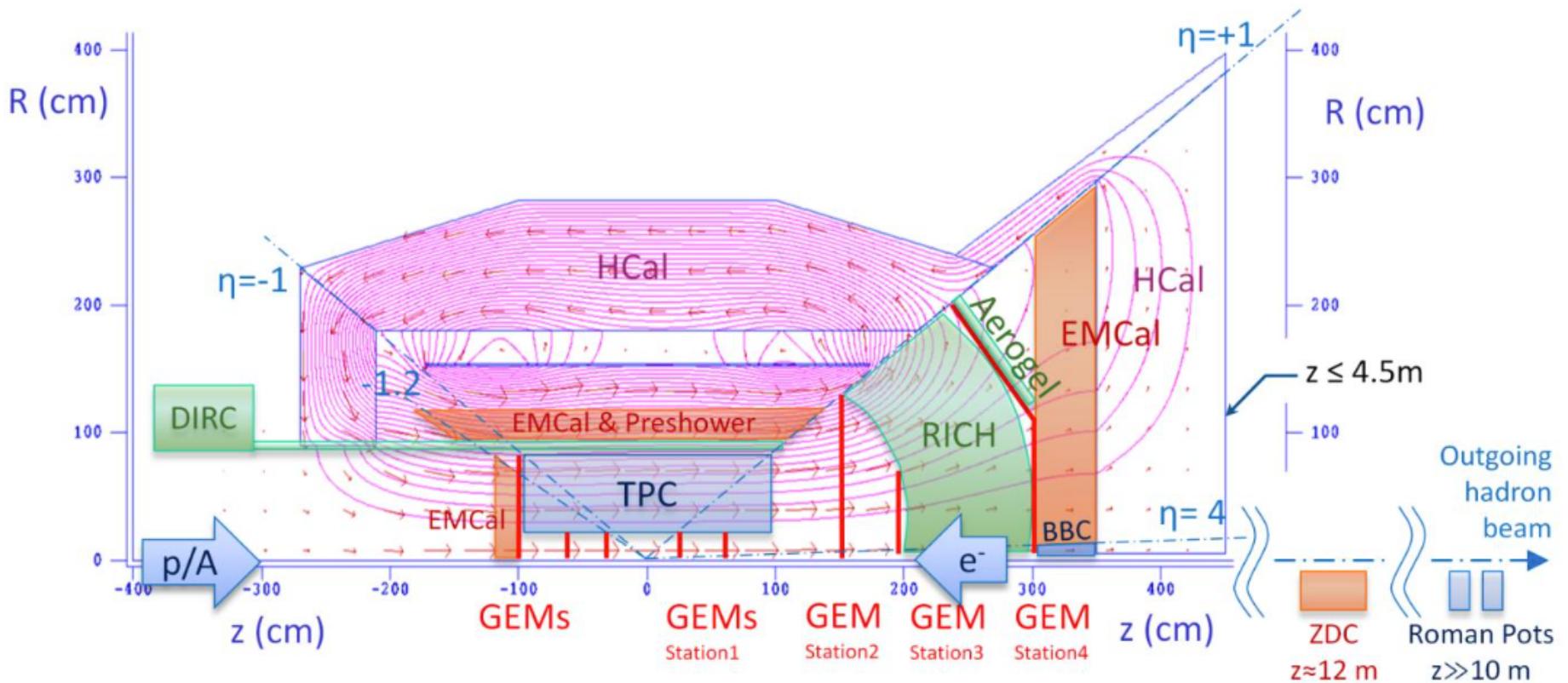


# DVCS process simulation for EIC

Vasily Jorjadze

November 29, 2016

# Electron Ion Collider Detector



# Deep Virtual Compton Scattering

Deeply Virtual Compton Scattering (DVCS) is the exclusive production of a real photon in diffractive lepton – hadron interactions :  $ep \rightarrow e\gamma$ . Process is calculable in pQCD (NLO) and cross section depends on GPD.

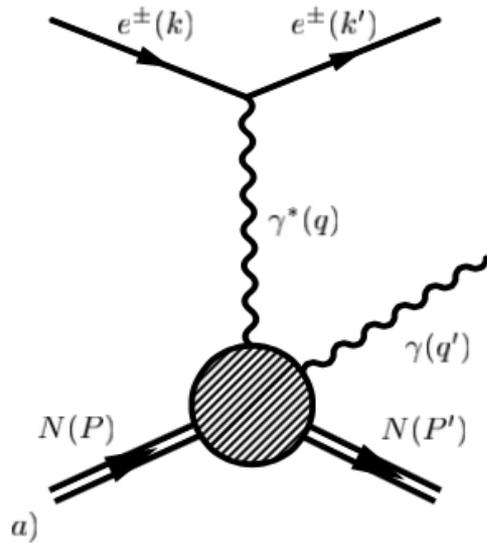
arXiv:hep-ph/0411389v1 E. Perez, L. Schoeffel, L. Favart

Simulation code milou:

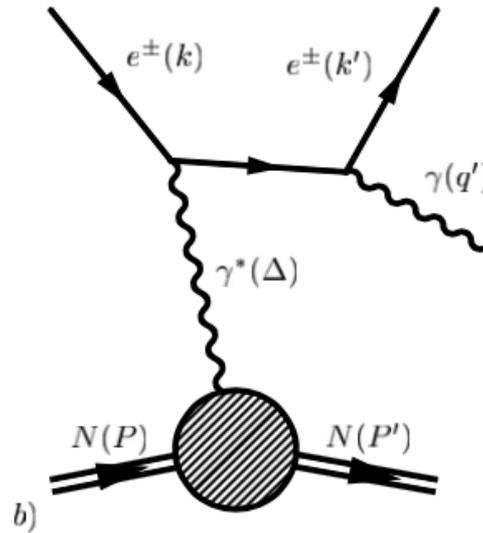
<https://wiki.bnl.gov/eic/index.php/MILOU>

# Deep Virtual Compton Scattering

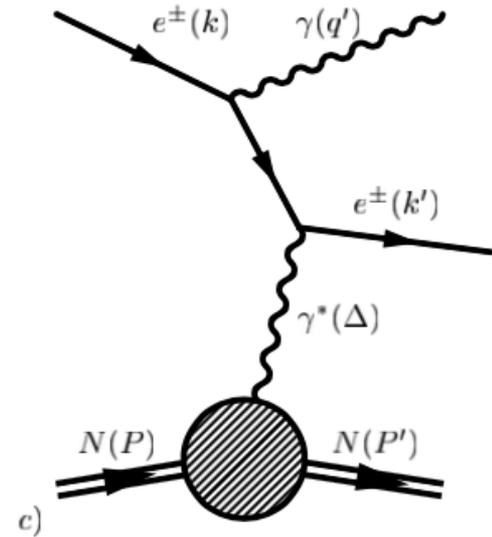
Process :  $ep \rightarrow ep\gamma$ . Simulation code milou:



DVCS : pQCD

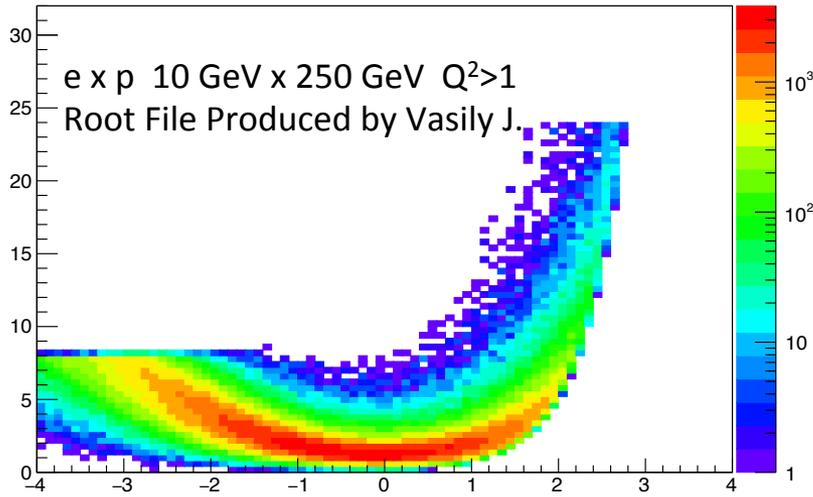


BH : EM

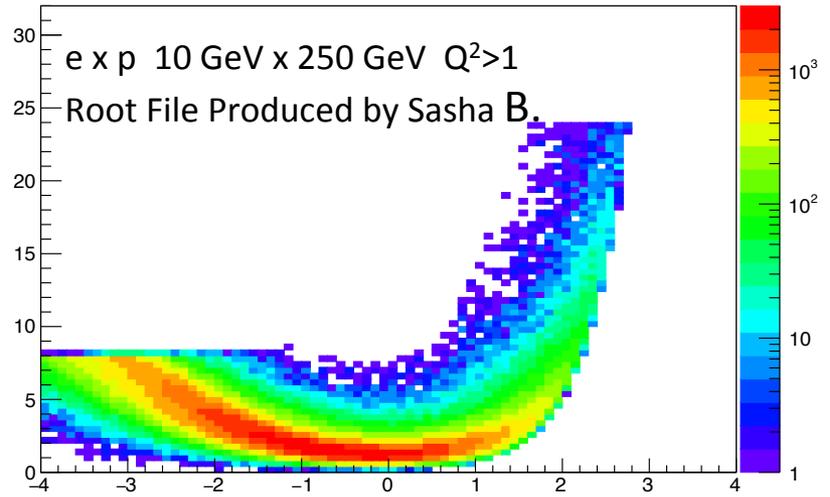


# DVCS Simulation: milou

Eg vs eta



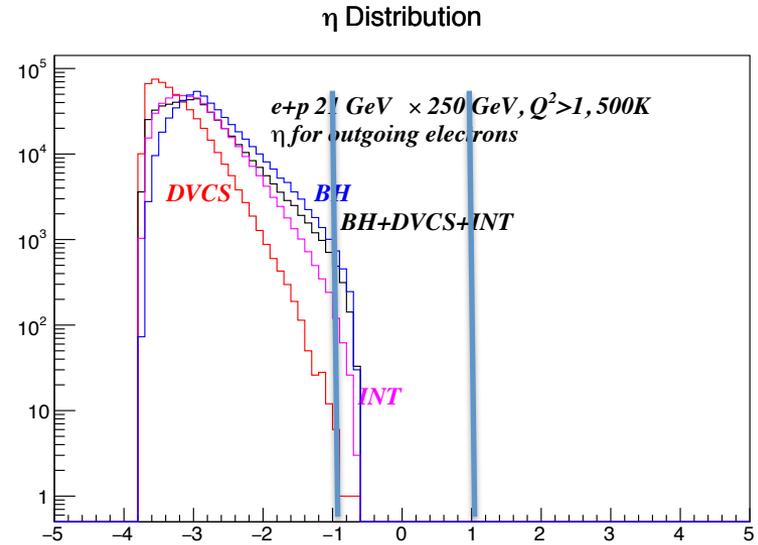
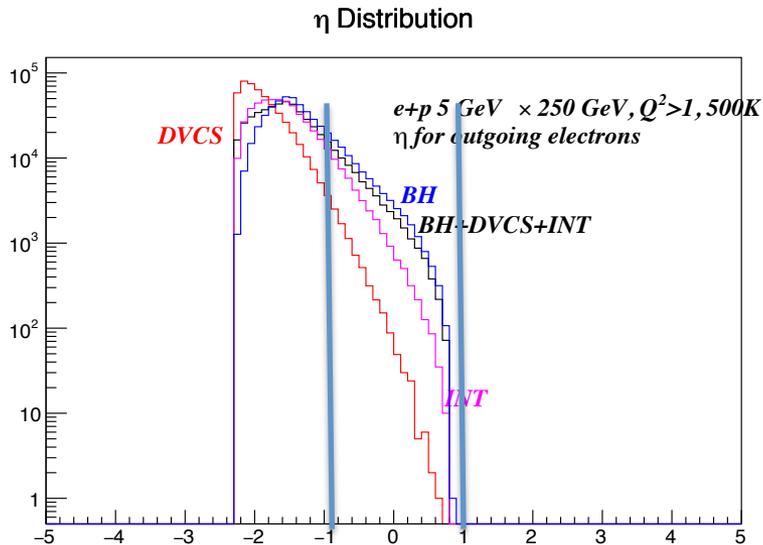
Eg vs eta



# DVCS Simulation: milou

- Proton momentum: 50 GeV/c - 250 GeV/c
- Electron momentum 5 GeV/c - 21 GeV/c
- Simulation performed for proton 250 GeV/c
- Simulation performed for electron 5 GeV/c and 21 GeV/c
- For each 5x250 and 21x250 four processes simulated
  
- 1) Bethe-Heitler (BH)
- 2) Deep Virtual Compton Scattering (DVCS)
- 3) Interference between BH and DVCS (INT)
- 4) BH + DVCS + INT
- Totally 8 samples
- Milou code and steering file from Sasha B. was used

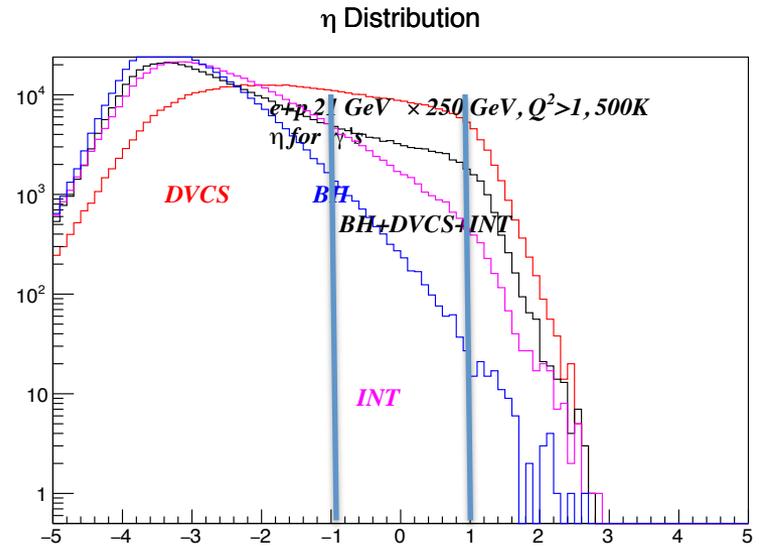
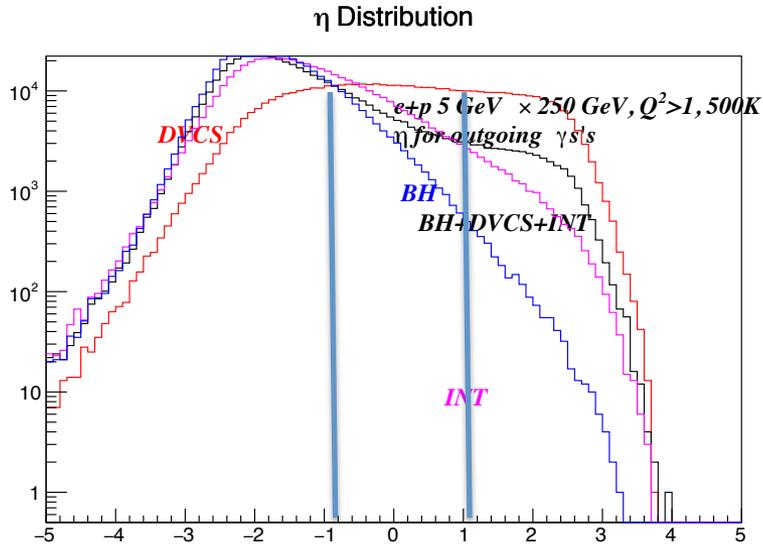
# milou Simulation: $\eta$ of $e^-$



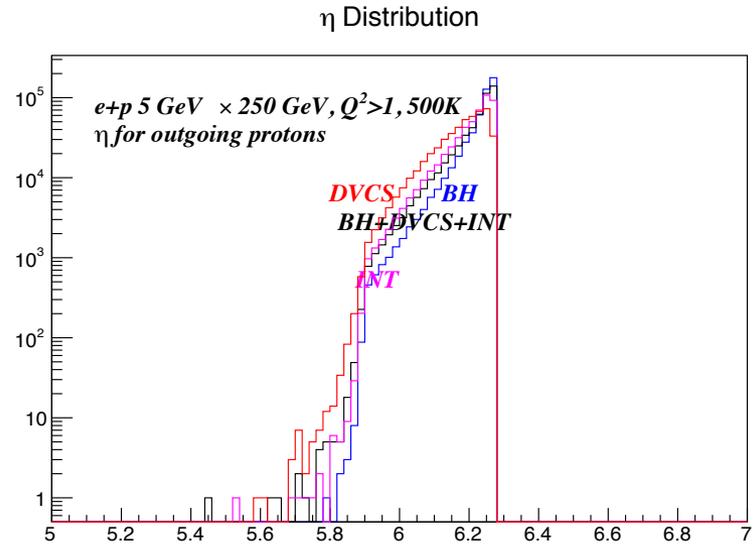
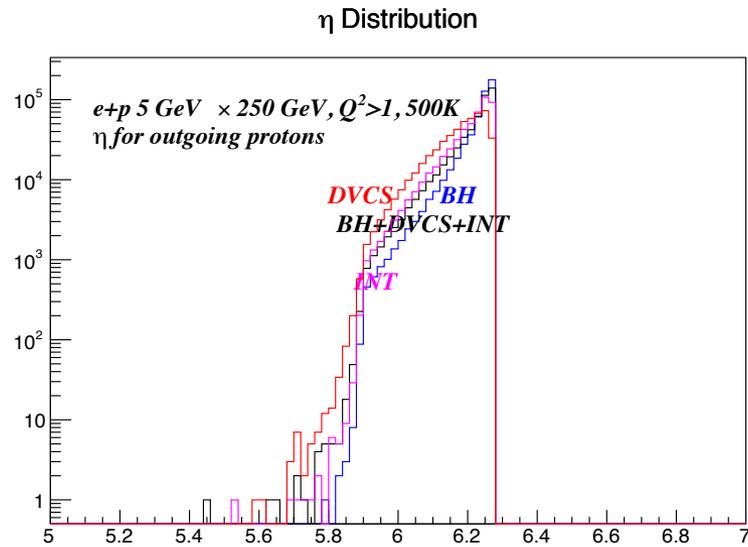
I PRO	$\eta < -1$	$\eta > 1$	$ \eta  < 1$	Process
1	397998	0	102003	BH
2	488918	0	11083	DVCS
3	448560	0	51441	INT
4	422046	0	77955	BH+DVCS+INT

I PRO	$\eta < -1$	$\eta > 1$	$ \eta  < 1$	Process
1	498535	0	1486	BH
2	499992	0	9	DVCS
3	499790	0	211	INT
4	499024	0	977	BH+DVCS+INT

# milou Simulation: $\eta$ of $\gamma$

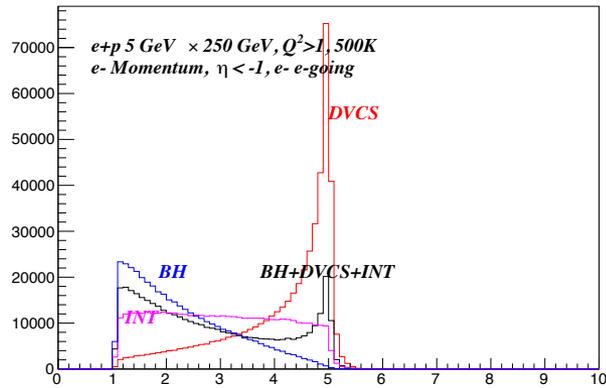


# milou Simulation: $\eta$ of protons

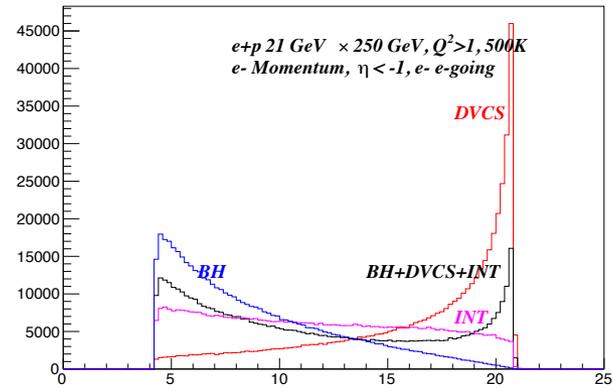


# milou Simulation: momentum of e-

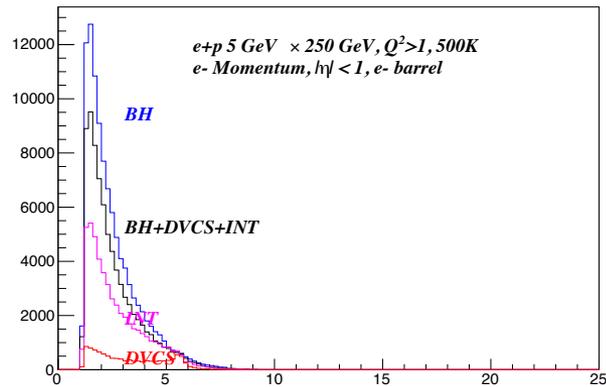
Momentum Distribution



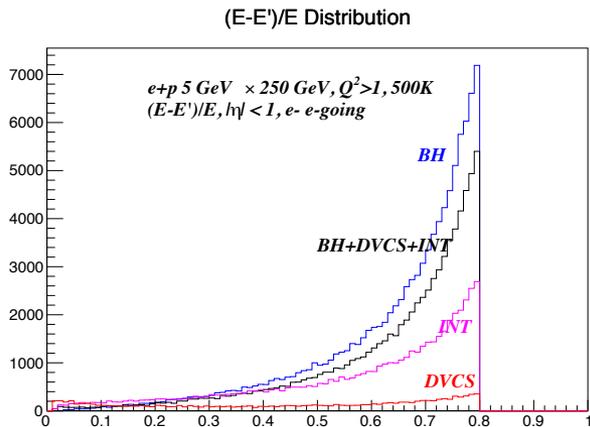
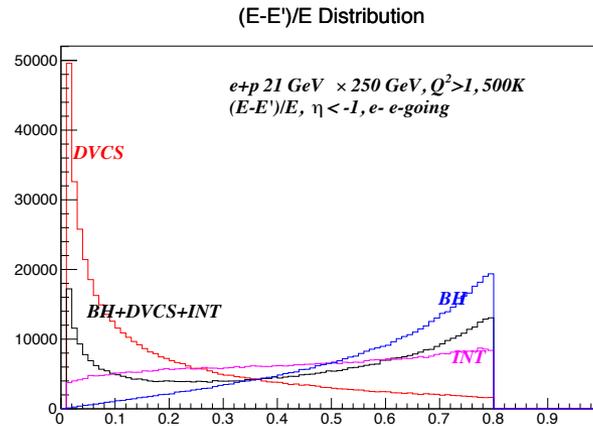
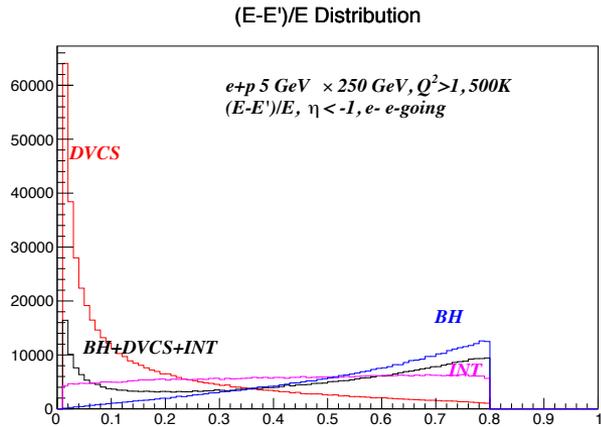
Momentum Distribution



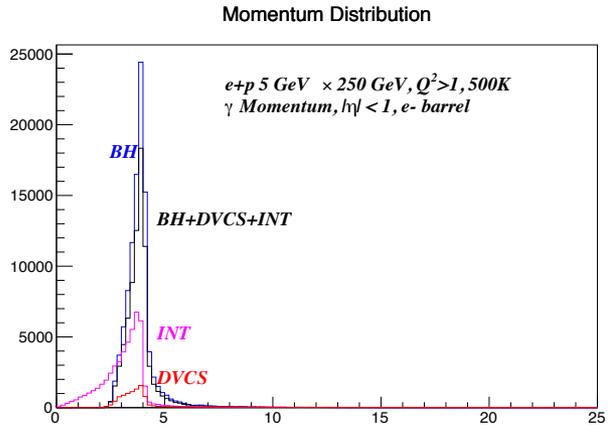
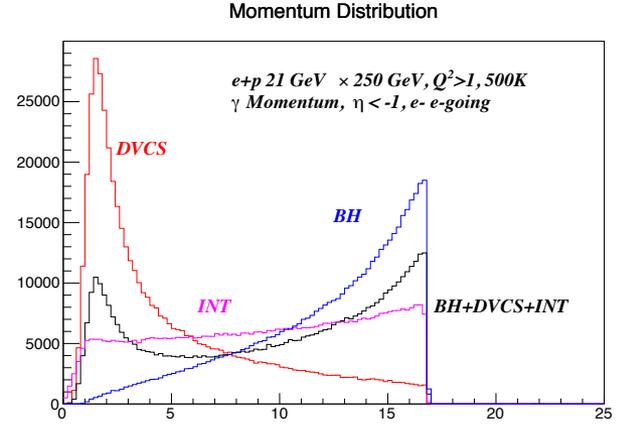
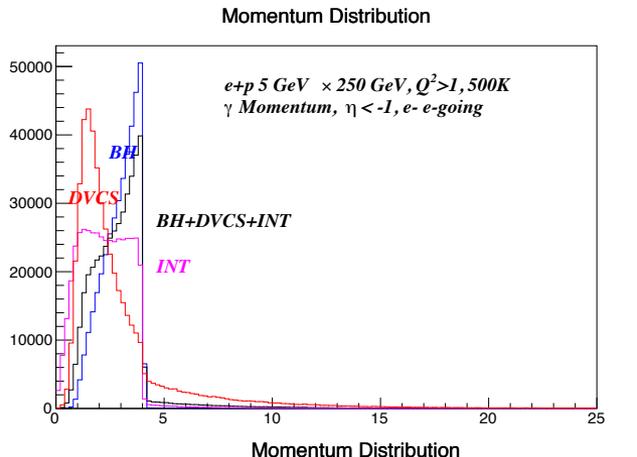
Momentum Distribution



# milou Simulation: inelasticity of e-

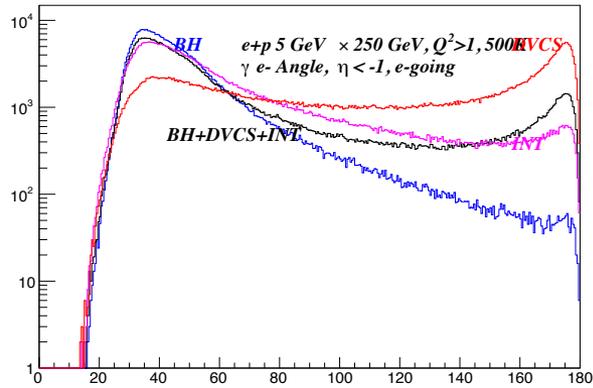


# milou Simulation: momentum of $\gamma$

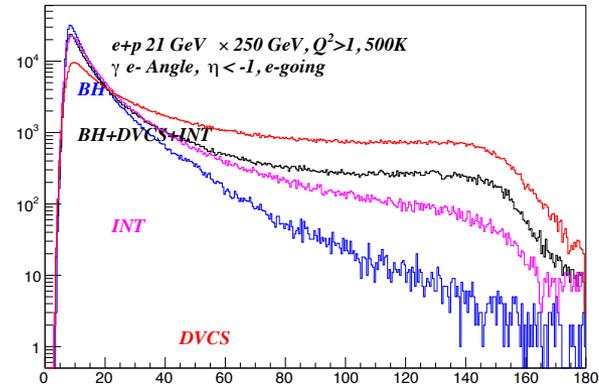


# milou Simulation: angle $e^{-}\gamma$

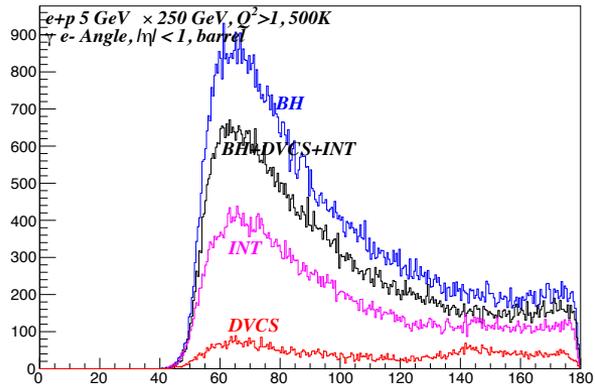
Angular Distribution, Degrees



Angular Distribution, Degrees



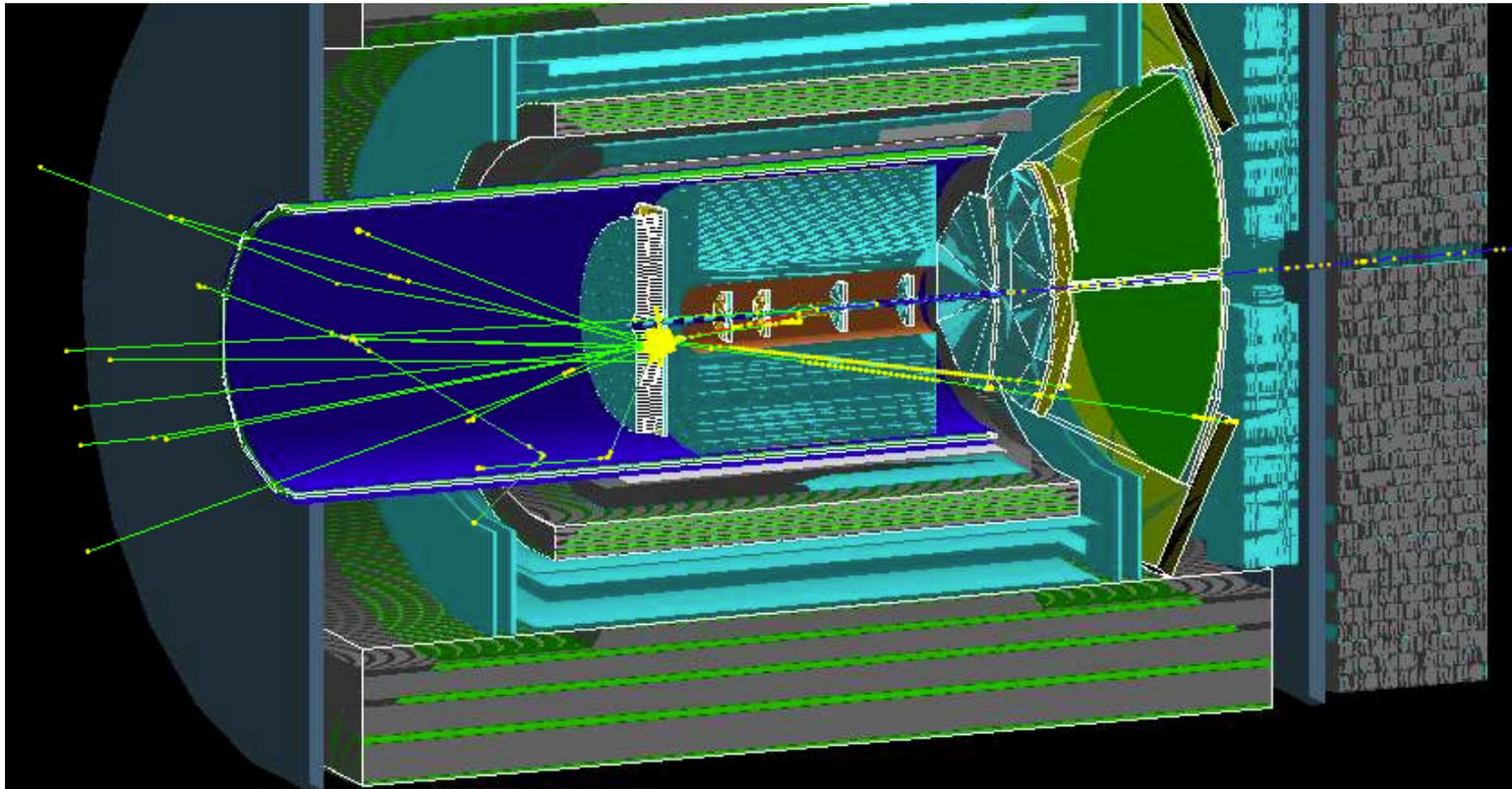
Angular Distribution, Degrees



# EIC Smearing

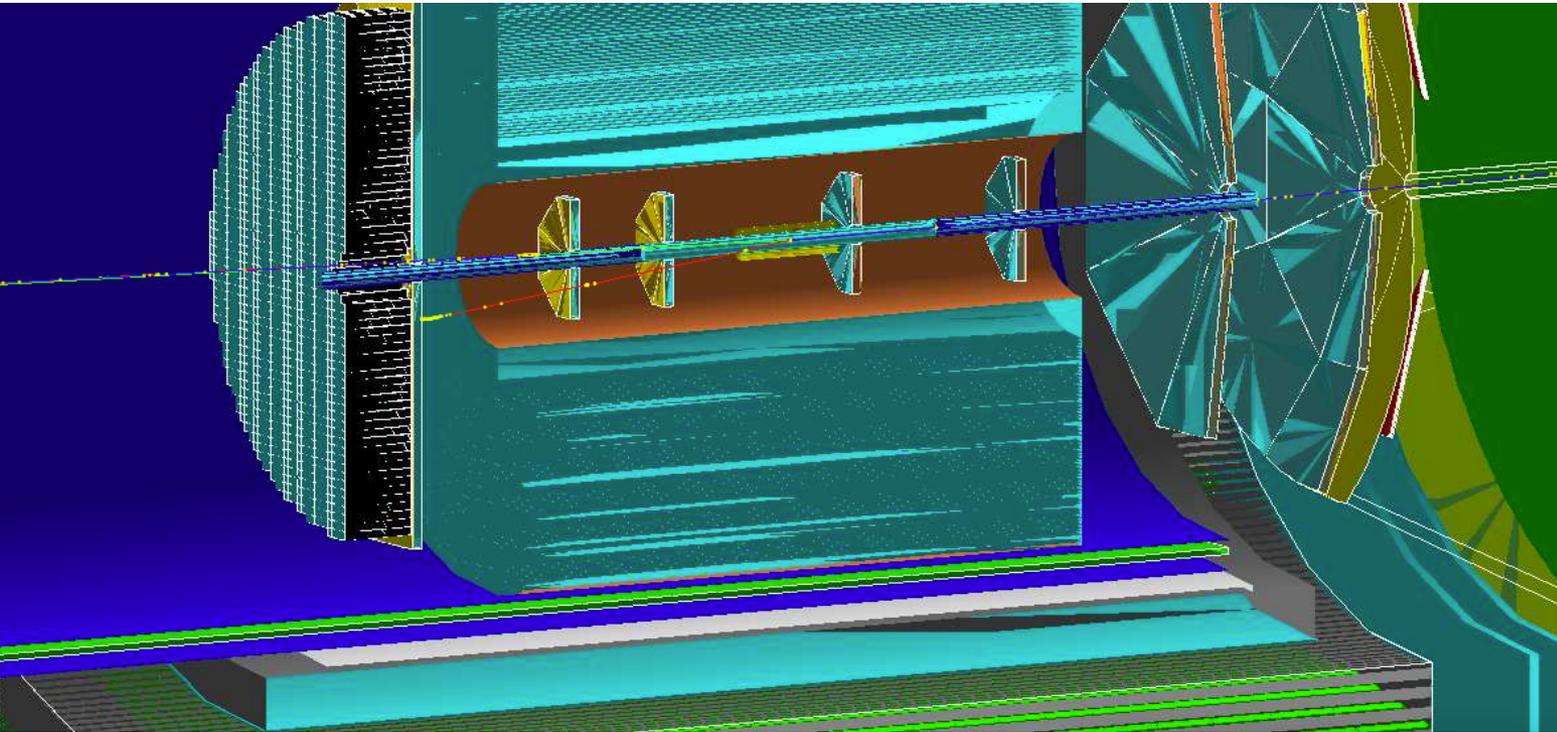
- <https://wiki.bnl.gov/eic/index.php/Eic-smear>
- The Monte Carlo smearing package **eic-smear** is a collection of classes and routines for analyzing Monte Carlo events and performing fast smearing to study the effects of detector resolution. It is designed for use with the ROOT analysis framework.
- **Monte Carlo:** A collection of classes describing events produced by various EIC Monte Carlo generators and routines for building ROOT trees of these events from ASCII input.
- **Smearing:** Classes and routines for applying fast detector smearing to the events produced by the Monte Carlo portion of the package.
- Chris Pinkenburg and Nils Feege developed software to make possible to use EIC generator output for G4 simulation.

# G4 Detector Respond



e- 21.0 GeV/c  
pr 250.0 GeV/c  
e- 5.1 GeV/c  
 $\gamma$  15.9 GeV/c  
pr 249.96 GeV/c  
Angle of  $\gamma$  1.4 degrees  
or  $\eta = 4.38$

# G4 Detector Respond



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